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and here the prime q and the exponent β have to be chosen so that p becomes a prime. The error consists in assuming $\lambda = 1$ and hence $q = 2$; that this does not give all the solutions, is evident from the examples:

$$\begin{array}{lll} q = 2, & \beta = 2, 3, 5 & q = 3, \quad \beta = 2, 3, 5 \\ p = 3, 5, 17 & & p = 7, 19, 163 \end{array} \quad \begin{array}{ll} q = 5, & \beta = 3, 5 \\ p = 101, & 2501. \end{array}$$

214. (April, 1914.) Proposed by A. J. KEMPNER, University of Illinois.

Let a be a positive integer ≥ 2 , and let $T(n)$ denote the number of distinct divisors of the positive integer n , including both 1 and n , so that $T(1) = 1$, $T(2) = 2$, $T(3) = 2$, $T(4) = 3$, \dots . Show that

$$\sum_{n=1}^{n=\infty} T(n)/a^n = \sum_{n=1}^{n=\infty} 1/(a^n - 1).$$

The special case $a = 10$ gives, as is easily seen:

$$9 \sum_{n=1}^{n=\infty} \frac{T(n)}{10^n} = \frac{1}{1} + \frac{1}{11} + \frac{1}{111} + \frac{1}{1111} + \dots$$

SOLUTION BY FRANK IRWIN, University of California.

We prove the proposition first for the special case, $a = 10$. We have,

$$\begin{aligned} 1/9 &= .11111111\dots, & 1/99 &= .01010101\dots, \\ 1/999 &= .001001001\dots, & 1/9999 &= .00010001\dots, \end{aligned}$$

and so on.

Let us determine the sum of all the digits in the n th decimal place. Since the k th row of the above array reads

$$1/99\dots99 = .00\dots00100\dots001\dots,$$

with k 9's on the left and $(k - 1)$ 0's in each recurring period on the right, it follows that we get a 1 in the n th decimal place whenever k is a divisor of n , and otherwise a zero. We have, then, $T(n)$ units in this place, and since a unit there has the value $1/10^n$, their sum is $T(n)/10^n$; and the sum of our series, $1/9 + 1/99 + 1/999 + \dots$, is equal to

$$\sum_{n=1}^{n=\infty} T(n)/10^n,$$

as was to be proved.

(It is clear that, regarding the array as a double series, we have a right to put the sum by rows equal to the sum by columns.)

In the general case, where we have any a , we need merely suppose the decimals above written in the scale of a , instead of in that of 10,

$$1/(a - 1) = .1111\dots, \quad 1/(a^2 - 1) = .0101\dots, \text{ etc.,}$$

and a like argument holds.

QUESTIONS AND DISCUSSIONS.

[Send all Communications to U. G. MITCHELL, University of Kansas, Lawrence, Kans.]

DISCUSSIONS.

I. RELATING TO NAPIER'S LOGARITHMIC CONCEPT.

BY H. S. CARSLAW, University of Sydney, Australia.

In the March number of the MONTHLY, page 71, Professor Cajori takes exception to the following remark, contained in a paper of mine in the *Mathematical Gazette* (Vol. VIII, page 77):